

WHAT IS CLAIMED IS:

1. A control apparatus for an internal combustion engine, comprising:
 - a suppression device which suppresses knock by retard-correcting an ignition timing based on a correction amount which is increased or decreased depending on the presence or absence of knock;
 - a valve overlap controller which controls a valve overlap amount of an intake valve and an exhaust valve to a value appropriate for an engine operating state; and
 - a guard controller which applies an upper limit guard to limit the valve overlap amount using an upper limit guard value in accordance with the correction amount and the engine operating state.
2. The control apparatus according to claim 1, wherein the guard controller sets the upper limit guard value smaller as the correction amount becomes a value that increasingly retards the ignition timing.
3. The control apparatus according to claim 1, wherein the guard controller does not apply the upper limit guard to limit the valve overlap amount using the upper limit guard value until the correction amount becomes a value which retard-corrects the ignition timing a predetermined amount or more.
4. The control apparatus according to claim 1, wherein the guard controller sets a minimum value for the upper limit guard value according to the engine operating state.
5. The control apparatus according to claim 1, wherein the guard controller does not apply the upper limit guard to limit the valve overlap amount using the upper limit guard value when the engine is operating under a high load where engine output is to be given priority.
6. The control apparatus according to claim 1, wherein when applying the upper limit guard to limit the valve overlap amount using the upper limit guard value, the guard controller reduces the valve overlap amount by retarding the intake valve and advancing the exhaust valve, and varies a ratio of a retard amount of the intake valve to an advance amount of the exhaust valve according to the engine operating state.

7. The control apparatus according to claim 1, wherein the guard controller varies, in accordance with the engine operating state, the rate at which the valve overlap amount is reduced when reducing the valve overlap amount with the upper limit guard value.
8. The control apparatus according to claim 1, wherein the guard controller sets the upper limit guard value based on an engine load and the correction amount by referencing a map.
9. A control method for an internal combustion engine, comprising the steps of:
suppressing knock by retard-correcting an ignition timing based on a correction amount which is increased or decreased depending on the presence or absence of knock;
controlling a valve overlap amount of an intake valve and an exhaust valve to a value appropriate for an engine operating state; and
applying an upper limit guard to limit the valve overlap amount using an upper limit guard value in accordance with the correction amount and the engine operating state.
10. The control method according to claim 9, wherein the upper limit guard value is set smaller as the correction amount becomes a value that increasingly retards the ignition timing.
11. The control method according to claim 9, wherein the upper limit guard is not applied to limit the valve overlap amount using the upper limit guard value until the correction amount becomes a value which retard-corrects the ignition timing a predetermined amount or more.
12. The control method according to claim 9, wherein a minimum value for the upper limit guard value is set according to the engine operating state.
13. The control method according to claim 9, wherein the upper limit guard is not applied to limit the valve overlap amount using the upper limit guard value when the engine is operating under a high load where engine output is to be given priority.
14. The control method according to claim 9, wherein when the upper limit guard is

applied to limit the valve overlap amount using the upper limit guard value, the optimum value is reduced by a retard of the intake valve and an advance of the exhaust valve, and a ratio of a retard amount of the intake valve to an advance amount of the exhaust valve is varied according to the engine operating state.

15. The control method according to claim 9, wherein the rate at which the valve overlap amount is reduced when the valve overlap amount is reduced by the upper limit guard value is varied in accordance with the engine operating state.

16. The control method according to claim 9, wherein the upper limit guard value is set based on an engine load and the correction amount by referencing a map.

17. A control apparatus for an internal combustion engine, which suppresses knock by retard-correcting an ignition timing based on a correction amount which is increased or decreased depending on the presence or absence of knock, and which controls a valve overlap amount of an intake valve and an exhaust valve to a value appropriate for an engine operating state, the control apparatus comprising:

guarding means for applying an upper limit guard to limit the valve overlap amount using an upper limit guard value in accordance with the correction amount and the engine operating state.